

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-79 are pending in this application. Claims 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, and 24-78 stand withdrawn from consideration in response to a previous Restriction Requirement. Claim 1 is amended and Claim 79 is added by the present amendment.

Amendments to Claim 1 and new Claim 79 find support in the application as originally filed at least at paragraph [0058], and paragraphs [0081]-[0102] of the specification, and Figure 4. Thus, no new matter is added.

In the outstanding Office Action, Claims 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, and 23 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 6,563,318 to Kawakami et al. (herein "Kawakami"). Applicant respectfully traverses that rejection with respect to amended Claim 1 and new Claim 79.

Amended Claim 1 is directed to a method of confirming a battery charge amount and degradation state that includes, in part, a first step of measuring or calculating at a plurality of battery temperatures a cycle test battery in respect of battery internal and surface temperatures and one selected from battery open voltage, current and voltage during discharge, and current and voltage during charging at prescribed time intervals substantially until an end of life of the cycle test battery. The method also includes a second step of using measured or calculated values to generate a determination table showing relationships between charge amounts and degradation states at the prescribed time intervals. The method also includes a third step of measuring or calculating a subject battery in respect of the battery internal and surface temperatures and the one selected from battery open voltage, current and voltage during discharge, and current and voltage during charging. In addition, the method includes a fourth step of comparing determination table values with the battery internal and

surface temperatures and at least one measured or calculated value of the subject battery to make a primary confirmation of a present subject battery charge amount and degradation state in accordance with a determination table location of matching values and to make an overall confirmation of results of the primary confirmation based on an appearance ratio of the determination table location, thereby estimating the present subject battery charge amount and degradation state.

Since a battery uses chemical reaction to generate electricity, batteries having the same active material or rating can have different degradation states depending on the state in which each battery is kept and used and on the temperature environment.¹ As a result, since it is unusual for the battery to suddenly become unusable, it may be difficult to accurately display, in a short time, the remaining charge and the degradation state of the battery.²

In an embodiment according to Claim 1, one of the open voltage, current and voltage during discharge and current and voltage during charging of a cycle test battery is measured at plural environmental temperatures comprising low, normal and high temperatures at prescribed time intervals fullest possible times until the end of life of the cycle test battery.³ Based on the data obtained as a consequence of the measurement, a determination table is prepared.⁴ In other words, a probabilistic estimation of the charge amount, capacity and end of life of a measured battery may be performed using a determination table prepared based on actually measured values.

Since the determination table is prepared based on the actually measured values, the capacity and end of life of the battery can substantially be accurately estimated in a short time.⁵

¹ Specification, paragraph [0003].

² Specification, paragraph [0003].

³ Specification, paragraph [0036].

⁴ Specification, paragraph [0037].

⁵ Specification, paragraph [0107].

Applicant respectfully submits that Kawakami fails to teach or suggest each of the features of amended Claim 1.

Kawakami describes a method for detecting an internal state of an inspective rechargeable battery comprising acquiring in advance averaged basic data obtained from data on the voltage and the electricity storable capacity or discharge capacity of plural normal rechargeable batteries at various kinds of temperatures during charging and discharge using various degrees of electric currents, then measuring the voltage value or voltage and current values of the rechargeable batteries under detection, and comparing the measured values with the basic data to compute a remaining capacity of the rechargeable battery or a usable capacity thereof with which an instrument can be operated.⁶

However, Applicant respectfully submits that the basic data obtained in Kawakami is average data obtained from battery voltages and stored electricity quantities or discharged electricity quantities measured through charging and discharging plural normal rechargeable batteries that are not degraded under various temperature conditions using various degrees of electric currents and data obtained through computer simulation.⁷ Thus, the basic data obtained in Kawakami is based not on actually measured values alone, but also based on data obtained through computer simulations.⁸ In addition, Kawakami uses an approximation formula to calculate an increased internal resistance and a decrease ratio of the electricity storable capacity.⁹

However, Kawakami fails to teach or suggest a method of calculating the end of life of a particular battery. Since a battery uses chemical reactions to generate electricity, even batteries having the same active material or rating can have *different* degradation states depending on the state in which each battery is kept and used, for example, based on

⁶ Kawakami at Claim 2.

⁷ Kawakami at col. 5, line 31 to col. 6, line 23 and col. 11, line 1 to col. 14, line 29.

⁸ Kawakami at col. 51, line 45 to col. 53, line 35 and col. 11, line 1 to col. 14, line 29.

⁹ Kawakami at col. 17, lines 6-37; col. 22, 19-64, and col. 36, lines 39-43.

temperature and on other environmental factors.¹⁰ Use of an approximation formula only results in a uniformly calculated end of life approximation for a type of battery. Since, during the course of this calculation according to Kawakami, individual states in which batteries are kept and used, such as temperature and other environmental factors, are not taken into consideration, it is difficult for a method according to Kawakami to stochastically estimate the end of life of a battery.

On the other hand, the measured values constituting the determination table used in the claimed method of confirming a battery charge amount and degradation state are, as described above, all actually measured values. According to the claimed inventions, therefore, the battery charge amount of the battery under test can accurately be measured in a short period of time.¹¹

The actually measured data constituting the determination table is obtained by the actual measurements made using plural environmental temperatures until the end of life of the cycle test battery. Accordingly, using the claimed method, the charge amount and degradation state can accurately be measured in a short period of time irrespective of how the battery under test is used.¹²

Since the determination table used in the present invention is constituted as stated above by the actually measured data and, as described in paragraph [0083] of the present published specification, increasing the number of measurements of the voltage or the voltage and current of the battery under test enables the present charge amount and degradation state of the battery under test to be estimated more accurately.

Accordingly, it is respectfully submitted that Kawakami fails to teach or suggest “comparing determination table values with said battery internal and surface temperature and at least one measured or calculated value of the subject battery,” as recited in amended Claim

¹⁰ Specification at paragraph [0003].

¹¹ Specification at paragraph [0110].

¹² Specification at paragraph [0111].

1. Also, it is respectfully submitted that Kawakami fails to teach or suggest making "an overall confirmation of results of the primary confirmation based on an appearance ratio of said determination table location, thereby estimating said present subject battery charge amount and degradation state," as recited in amended Claim 1.

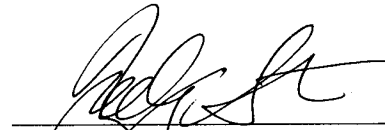
Accordingly, it is respectfully requested the rejection under 35 U.S.C. § 103(a) be withdrawn.

Therefore, Applicant respectfully submits that independent Claim 1 and claims depending therefrom are allowable.

Consequently, in light of the above discussion and in view of the present amendment this application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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